

National University of Life and Environmental Sciences of Ukraine

Department of Silviculture

“ЗАТВЕРДЖЕНО”

Навчально-методичною комісією
ННІ лісового і садово-паркового господарства
“11” червня_2025 р. (Протокол № 7)

Curriculum of Academic Discipline
“LANDSCAPE FIRES: SCIENCE AND MANAGEMENT”

Field of knowledge: Agricultural, Forestry, Fisheries and Veterinary medicine

Specialty: H4 Forestry

Academic programme: Forest Management in Eastern Europe

Institute: Education and Research Institute of Forestry and Landscape-Park
Management

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Kyiv – 2025

Description of the course: «Landscape Fires: Science and Management»

The course devoted to better understanding by master students of biological, chemical and physical basics of burning process. Via better understanding of this process and pathways of developing of burning of fuel on local scale and on landscape scale the better fire management decisions on prevention and response to fires. A lot of attention in the course paid to outcomes of burning process in terms of contamination of environment by chemical substances and radionuclides and their impact on health of population and fire fighters. Essential attention in the course is devoted to basics of prevention strategy of forest fire brigades, preparedness, accumulation and use of data for planning of prevention measures and aggressive response to fires. Sometime within the course is devoted to use remote sensing products in operational and planning levels.

Academic degree, specialty, academic programme		
Academic degree	Master	
Specialty	H 4 Forestry	
Academic programme	Forest Management in Eastern Europe	
Characteristics of the discipline		
Type	Optional	
Total number of hours	150	
Number of ECTS credits	5,0	
Number of content modules	2	
Course project (work)	No	
Indicators of the course for full-time and part-time forms of study		
	Full time	Part time
Course (year of study)	2025–2026	2025–2026
Semester	2	2
Lecture, hours	30	12
Practical/seminar classes, hours	30	12
Self-study, hours	30	36
Individual assignments, hours	60	90
Number of weekly classes	4	

1. Purpose, competencies and program results of the academic discipline

The purpose of the discipline "Vegetable Fires: Science and Management" is to train the master in modern knowledge of the dynamics of the fire environment as a natural phenomenon in an environment caused by anthropogenic influence.

The objectives of the discipline are to study:

- combustion process and its development in forest ecosystems and landscapes;
- the theoretical foundations of the formation and dynamics of the fire environment and the parameters that describe them;

- practical application of methods for studying factors that influence the development of fires, including the accumulation and dynamics of combustible materials in landscapes of various types, fire risks and fire danger of ecosystems, fire climate, anthropogenic factors that impact fire regimes;
- methods for collecting experimental and analytical data for modeling the behavior of fires at the level of a separate forest stand, landscape and region;
- methods of collecting analytical information for the development of a system for the prevention, extinguishing of landscape fires and rehabilitation of ecosystems damaged by fires.

Acquisition of competencies:

Integral competence (IC):

The ability to solve complex tasks and practical problems in the field of vegetation fires, which involves the application of theories and methods of forestry science to ground fire management tasks including taking into account complexity of the incidents and compliance with factors that impact ignition and fire behavior.

General competencies (GC):

GC 7. Knowledge and understanding of the subject area and understanding of the profession; GC 8. Ability to apply knowledge in practical situations; GC 9. Ability to learn and master modern knowledge; GC 10. Desire to preserve the environment; GC 11. Skills in performing safe activities.

Special (professional) competencies (SC):

SC 1. Ability to apply knowledge and skills of forest science and practical experience in forest management; SC 6. Ability to choose proper equipment and tools to solve a formulated task, as well as to assess the economic efficiency of its implementation. SC 12. Ecological thinking and awareness, attitude to nature as a unique value that ensures the living conditions of mankind, personal responsibility for the state of the environment at the local, regional, national and global levels.

Program learning outcomes (PLN):

PLN 4. Possess basic humanitarian, natural science and professional knowledge to solve tasks in the organization and management of forestry; PLN 6. Select and use the necessary equipment, tools for organizing the production process, taking into account environmental, technical and technological capabilities; PLO 7. Apply legislative acts, regulatory and reference materials, organizational and management documentation on the organization and management of forestry and hunting, knowledge of economics and law to ensure effective production activities; PLO 9. Apply well-known forestry methods of collecting research material and its statistical processing; PLO 10. Analyze the results of research on forestry and taxonomic indicators of trees, stands, their productivity, the state of plantations and the environment, the state of hunting animals and their food base; PLO 11. Evaluate the significance of the results of research on trees, stands, plantations, forest areas and the state of the environment, the state of hunting animals and their food base and make reasoned conclusions; PLO 14. Perform professional tasks clearly and qualitatively, improve the technology of their implementation and train others; PLO 16. Organize effective and safe working conditions.

2. Programme and structure of the discipline

Modules and topics	Amount of academic hours												
	Full time form							Part time form					
	Weeks of semester	Total	у тому числі					Total					
			L	P	labs	Ind	Independent		L	P	Labs	Ind	Independent
Module 1													
Topic 1. Impact of war and climate change on forest and landscape fires in Ukraine. State system of landscape fire management.	1–2	18	4	4	–	–	10	18	2	2	–	4	10
Topic 2. The basics of combustion theory and the impact of fires on the environment	3–4	18	4	4	–	–	10	18	2	2	–	4	10
Topic 3. Fire hazard and fire danger of landscapes and weather	5–6	23	4	4	–	–	15	21	1	1	–	4	15
Topic 4 Legal support and institutional organization of State System of Forest Fire Management	7–8	18	4	4	–	–	10	18	1	1	–	6	10
Total Module 1	–	77	16	16	–	–	45	85	6	6	–	18	45
Module 2													
Topic 5. Prevention of forest fires under the influence of war, climate change and post-war reconstruction	9–10	23	4	4	–	–	15	25	2	2	–	6	15
Topic 6 Forest fire crews. Personal safety of firefighters. Extinguishing of fires	11-12	23	4	4			15	25	2	2		6	15
Topic 7 Organization of extinguishing fires. International fire extinguishing standards EUROFIRE and Incident Command Systems	13-15	27	6	6			15	25	2	2		6	15
Total Module 2	–	73	14	14	–	–	45	75	6	6	–	18	45
Grand total	–	150	30	30	–	–	90	150	12	12	–	36	90

3. Lectures

MODULE 1. THEORETICAL BASIS OF FIRE ENVIRONMENT DYNAMICS AND FACTORS THAT IMPACT IT

Lecture 1. Impact of war and climate change on forests and landscape fires in Ukraine. State system of landscape fire management.

Introduction. Dynamic of area burned and number of fires in Ukraine during 1990-2023. Climate change, land reform and landscape fires. Catastrophic fires in 2020: Zhytomyr region (April 16), exclusion zone (April 4), Kharkiv region (June), Luhansk region (July - October). The state system of landscape fire management and its shortcomings

Lecture 2. The basics of combustion theory and the impact of fires on the environment.

Conditions for the occurrence and development of fire: from campfire to landscape burning

Components and chemical content of the wood burning process. Pyrolysis.

Generation and distribution of heat during combustion.

Heat transfer in a fire environment.

Air emissions of heavy metals and radionuclides during fires.

Lecture 3. Fire hazard and fire danger of landscapes and weather.

Concepts of combustible materials (fuel), natural fire hazards of forests and landscapes.

Scale of natural fire danger and its use.

Models of combustible materials and fire behavior.

Fire hazard of weather, its definition, application and relationship with fuel load.

Lecture 4. Legal support and institutional organization of State System of Forest Fire Management.

Normative regulation of forest fire management.

Classification signs of fires according to PPBvLU (2005) and the Code of Civil Protection.

The existing forest fire protection system, its advantages and disadvantages.

MODULE 2. INTEGRATED LANDSAPE FIRE MANAGEMENET

Lecture 5. Prevention of forest fires under the influence of war, climate change and post-war reconstruction

Assessment of fire risks is the basis of the strategy for their prevention.

Fire prevention: work with local authorities, population, control of ignition sources.

Spatial fire prevention measures: mineralized fire breaks, fire breaks, fire resilient forest edges.

Measures to increase the resilience of forest landscapes to fires and reduce the temperature of fires (" spoiler " - at the expense of planting deciduous trees).

Patrolling and combining fire prevention with fire response.

Lecture 6. Forest fire crews. Personal safety of firefighters. Extinguishing of fires.

Synthesis of previous topics: fuel, fire weather and the behavior of forest fires from the point of view of their extinguishing.

The requirements of the legislation of Ukraine on extinguishing fires.

Institutional structure of landscape protection against fires.

Forest fire stations.

Tasks, rights and duties of forest protection.

The structure of forest fire formations.

Health and life safety of firefighters and personal protective equipment (PPE).

Management of forces and means in extinguishing fires.

Lecture 7. Organization of extinguishing fires. International fire extinguishing standards EUROFIRE and Incident Command Systems.

Fire response procedure.

Strategy and tactics of extinguishing fires in Ukraine according to the NPA.

Ways and methods of extinguishing forest and peat fires.

Methods of annealing.

Engagement of aviation for extinguishing.

Organization of departmental and operational headquarters for extinguishing fires.

Organization of fire communication.

International standards for extinguishing forest fires: ICS and EUROFIRE.

4. Practical classes

№	Topic	Academic hours
1	Impact of forest fires on the environment; causes of forest fires and their evolution; impact of economic and social factors on forest flammability; features of seasonal fire dynamics	4
2	Fire environment parameters and fire behavior. Fire environment components that influence the change in fire behavior	4
3	Classifications of forest combustible materials, their theoretical justification and possibility of application for the conditions of Ukraine Humidification and drying of forest combustible materials.	4

	Calculation of the drying coefficient of forest combustible materials	
4	Using weather forecasts when calculating meteorological indicators of fire danger from weather conditions	4
5	Analysis of the actual flammability of Ukrainian forests. Main criteria for assessing the actual flammability of Ukrainian forests. Measures to increase the resistance of forest landscapes to fires and reduce the temperature of fires	4
6	The combustion process of forest combustible materials. Calculation of the main combustion indicators.	4
7	Methodology for compiling local fire hazard scales based on weather conditions	2
8	Calculation of parameters of forest fires	4
	Total	30

6. Methods and means of diagnosing learning outcomes:

- exam;
- testing
- oral discussion or written quest;
- defense of practical works.

7. Learning methods:

- problem-based learning method;
- practice-oriented learning method;
- case method;
- project learning method;
- research learning method;
- method of educational discussions and debates;
- method of teamwork, brainstorming;
- gamified learning method.

8. Assessment of learning outcomes:

The assessment of the knowledge of a student is carried out on a 100-point grade and is translated into a national scale in accordance with the "Regulations on Examinations and Tests at the NUBiP of Ukraine".

8.1. Distribution of points by types of educational activities

Type of educational activity	Learning outcomes	Evaluation
	Module 1 .	
Lecture 1 (<i>if there is an assessment</i>) Laboratory/practical work 1.	PLO 4, 6, 7, 10, 11, 14, 16. Know the main indicators that characterize the problem of forest fires in Ukraine (including the damage caused by fires); indicators of forest flammability; the	15

	impact of forest fires on the environment; the causes of forest fires and their evolution; the impact of economic and social factors on forest flammability; features of the seasonal dynamics of fires; the current state of forest protection from fires in Ukraine; the main characteristics of forest fires in the world.	
Lecture 2 (<i>if there is an assessment</i>) Laboratory/practical work 2.	PLO 6, 10, 11, 14, 16. Know the combustion process organic substances, fire environment, combustion, fire behavior, plant combustible materials, types of combustion of forest materials, calorific value of forest combustible materials, physical principles of extinguishing the combustion process; social factor and its influence on fires.	15
Lecture 3 (<i>if there is an assessment</i>) Laboratory/practical work 3.	PLO 4, 6, 10, 11, 14, 16. Know the definition of a forest fire; conditions for the occurrence and development of forest fires; classification of forest fires; characteristics of forest fires; classification of forests by natural fire hazard; fire hazard scale under weather conditions; features of the development of forest fires in forests of different composition.	15
Lecture 4 (<i>if there is an assessment</i>) Laboratory/practical work 4.	PLO 4, 6, 10, 11, 14, 16. Know the basic provisions of the organization of forest fire protection; Regulatory and legal framework for forest fire protection; accounting for fires at the enterprise; basic documentation; determination of the dynamics of natural fire hazard and indicators of flammability of the forest fund; concept of a fire-dangerous season.	15
Modular test work		40
Total by module 1		100
Module 2		
Lecture 5 (<i>if there is an assessment</i>) Laboratory/practical work 5.	PLO 4, 6, 10, 11, 14, 16. Know the classification of fire prevention measures; measures to prevent the occurrence of fires; measures to prevent the spread of fires; forestry methods for reducing natural fire hazards; design of fire-fighting roads; design of fire-fighting reservoirs and other water supply facilities; arrangement of water intake sites.	15
Lecture 6 (<i>if there is an assessment</i>) Laboratory/practical	PLO 4, 6, 10, 11, 14, 16. Know the terms and definitions; design of fire observation towers and masts; calibration of the azimuth scale on the	15

work 6	observation tower; optical fire detection systems; organization of fire duty at the enterprise; organization of ground patrolling of the enterprise's forest fund; features of patrolling using unmanned aerial vehicles; organization of aviation patrolling; notification and procedure for action after detecting a fire; decision-making support system for detecting and extinguishing fires.	
Lecture 7 (<i>if there is an assessment</i>) Laboratory/practical work 7.8	PLO 4, 6, 10, 11, 14, 16. Know the terms and definitions; the regulatory framework for organizing fire extinguishing; drawing up a forest fire extinguishing plan; the responsibilities of the forest fire extinguishing manager; stages of forest fire extinguishing; assessment of changes in the fire environment and fire behavior; extinguishing large forest fires; the procedure for attracting additional firefighting forces and equipment from other departments; features of extinguishing fires in peatlands and fallow lands; principles of fire patrolling; the procedure for localizing and eliminating fires.	30
Modular test work		40
Total by module 2		100
Educational work	$(M1 + M2)/2 \cdot 0.7 \leq 70$	
Exam/test	30	
Total per course	$(\text{Coursework} + \text{exam}) \leq 100$	

8.2. Scale for assessing knowledge of a higher education applicant

Higher education applicant rating, points	Assessment according to the national system (exams/credits)
90-100	perfectly
74-89	good
60-73	satisfactorily
0-59	unsatisfactorily

8.3. Evaluation Policy

Deadline and resubmission policy:	Deadlines are set on the ENC for each assignment. Works submitted after the deadline without good reason are evaluated with a lower score than the specified evaluation criteria in the ENC. Re-siting of modules is possible with the permission of the lecturer if there are good reasons (for example, sick leave).
Academic Integrity Policy:	Plagiarism during practical, independent, test and exams is prohibited (including using mobile devices). Abstracts must

	have correct text references to the literature used
Visitation Policy:	Attendance at classes is mandatory. For objective reasons (e.g. illness, international internship), training may be conducted individually (in a distance learning mode, online form, upon agreement with the director of the institute)

9. Educational and methodological support:

- electronic educational course of the academic discipline (on the educational portal of the NUBiP of Ukraine eLearn ;
- lecture notes and their presentations (in electronic form);
- textbooks;
- methodological materials for studying the academic discipline for full-time and part-time higher education students;
- program of teaching practice of the academic discipline.

10. References

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